

SEGMENTAL BIOMECHANICS AFTER SINGLE AND MULTILEVEL LUMBAR SPINE FUSION

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Introduction

Clinical studies have reported the incidence of adjacent segment degeneration following posterior lumbar fusion over single or multiple spinal levels. Few existing biomechanical studies investigate the change in motion and stiffness of the fused and adjacent spinal joints following single vs multi-level posterior fusion. This preliminary study measured the change in segmental motion following single and dual-level lumbar fusion.

Methods

Four cadaveric lumbar spines (T12-S1, female, age =85±1) were loaded (2 deg/sec) to a maximum moment of ±7.5 Nm in the three planes of motion (axial rotation, AR, flexion-extension, FE, lateral bending, LB). Specimens were tested: i) intact, ii) following a single level, dual rod posterior fusion (5.5mm Ti rod) (L5-S1), and iii) following a two level, dual rod fusion (L4-S1). Segmental rotation was recorded using an optical tracking system and the fifth cycle of each test was analysed to investigate the change.

Results

The mean decrease in range of motion (ROM) of the instrumented joints relative to the intact condition was 28%, 33% and 40% for the single level fusion and 32%, 48% and 62%, for the two level fusion for AR, FE and LB, respectively. The mean increase in ROM at the spinal levels immediately superior to the fusion was 4%, 20% and 11% for the single level fusion and 12%, 32% and 34% for the two level fusion for AR, FE and LB, respectively.

Conclusion

This study showed the segmental motion of spinal joints superior to a single level posterior fusion increased compared to the intact condition and this increase was greater for a two level fusion. In vitro biomechanical studies such as this can help investigate the likelihood of adjacent segment degeneration following spinal instrumentation, and future studies will use experimental and computational methods to further understand the lumbar spine mechanics following single and dual level posterior fusion.

Word count: 299 (max. 300 words)